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MODELS FOR ESTIMATING ECONOMIC PRICE ADJUSTMENT (EPA) FUND REQUIREMENTS

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TECHNICAL REPORT

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ABSTRACT

In the current economic environment, it is prudent strategy for the Government to avoid the use of Economic Price Adjustment (EPA) clauses in procurement contracts. However, many vendors are insisting upon the inclusion of contractual EPA stipulations as a hedge against inflation. Consistent with the use of EPA clauses, Procuring Contracting Officers (PCO's) typically were committing EPA funds up to the contractual ceiling to assure that an over obligation of funds (an RS3679 violation) would never occur; a practice found to reserve funds in excess of requirements. Examined herein are current methods of determining the level of EPA funds to be reserved and the development of some improved methods for estimating these requirements. This management tool provides structured formulae which can improve justification of retained/committed EPA funds and allow the release of committed funds for use elsewhere.

MODELS FOR ESTIMATING ECONOMIC PRICE
ADJUSTMENT (EPA) FUND REQUIREMENTS

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I

SUMMARY

A. TITLE: Models for Estimating Economic Price Adjustment (EPA) Fund Requirements

B. PURPOSE: The purpose of this study was to develop methods for estimating the funds required for set aside to satisfy the contingent liability for economic price adjustment (EPA) payments on a contract by contract basis.

C. DATA: The data used were all extracted from individual procurement file folders, at the US Army Armament Materiel Readiness Command (ARRCOM), Rock Island, IL. The initial set of data was from completed contracts and was used to perform a static test. The succeeding data set was from open contracts and was used to perform a dynamic test.

D. RESULTING PREDICTIVE EQUATIONS: Each of the equations presented below is a model for estimating/projecting EPA fund requirements on a contract by contract basis.

1. General Model for EPA Computation.

$$EPA = P[(1 + R)^n - 1] \qquad \text{Equation (1)}$$

where:

EPA = amount of funds set aside

P = contract price

R = selected annual percentage rate

n = number of years in contract time frame

2. Actual Cost Model for EPA Computation

$$EPA(TOTAL) = EPA(LABOR) + EPA(MATERIAL) \qquad \text{Equation (2)}$$

$$EPA(LABOR) = \sum^{y} \sum^{b} \left[[L_b(L_e - 1)] \; (1 + L_f) \right]_y \qquad \text{Equation (3)}$$

$$EPA(MATERIAL) = \sum^{y} \sum^{b} [M_b(M_e - 1)]_y \qquad \text{Equation (4)}$$

where:

y = contract period in years

b = labor/material base(s) as specified in contract

L_b/M_b = labor/material base cost

L_e/M_e = labor/material cost estimate factor

L_f = labor fringe benefits

3. Cost Index Model for EPA Computation

$$\text{EPA(TOTAL)} = \text{EPA(LABOR)} + \text{EPA(MATERIAL)} \qquad \text{Equation (5)}$$

$$\text{EPA(LABOR} = \sum^{q}\sum^{i}\sum^{y}\left[(L_p \times L_{qa})\ \frac{(L_{qi} - L_{bi})}{L_{bi}}\right]P_y \qquad \text{Equation (6)}$$

$$\text{EPA(MATERIAL)} = \sum^{q}\sum^{i}\sum^{y}\left[(M_p \times M_{qa})\ \frac{(M_{qi} - M_{bi})}{M_{bi}}\right]P_y \qquad \text{Equation (7)}$$

where:

q = quarter

i = index

y = year

L_p/M_p = percent of contract price covered by EPA labor/material

L_{qa}/M_{qa} = allocation of L_p/M_p by quarter (expenditure profile)

L_{qi}/M_{qi} = forecasted quarterly index value for labor/material

L_{bi}/M_{bi} = base index value for labor/material

P_y = contract price by program year

E. CONCLUSION: The cost index and actual cost models, along with the supporting methodology and rationale, have been implemented at HQ, ARRCOM and provide structured formulas by which ARRCOM will improve justification of retained/committed EPA set aside funds, while at the same time, releasing otherwise committed funds for current use elsewhere.

II

BACKGROUND AND GENERAL APPROACH

Early in 1978, funding problems were encountered on two offshore procurements entered into by the US Army Armament Materiel Readiness Command (ARRCOM). Analysis of these problems highlighted two basic areas. First, the contracts required payment in a foreign currency, and the rapid ongoing deterioration of the value of the dollar vis-a-vis foreign currencies exceeded the anticipated expenditure rate. Secondly, both contracts contained an economic price adjustment (EPA) clause which was linked to measures of the respective foreign economies. These measures were increasing at a rate which exceeded estimates that had been made for this type of cost growth.

When the funding problems on the two foreign procurements were resolved, it was decided that effort be expended to determine whether similar funding problems were occurring in domestic contracts due to EPA clauses.

The progress of this study was a stepwise development. Initially, an in-house document search was made to determine the number of domestic contracts containing EPA clauses available for comparative review and analysis. Also, appropriate and governing regulations were collected and studied with emphasis on understanding/interpretation and application. A concurrent out-of-house document search, consisting of bibliographic search and resulting document review, plus a wide spread word-of-mouth solicitation for any work done in this area of interest was also conducted. These efforts were further supplemented with interviews and general discussions with people who were either directly or indirectly associated or involved with EPA. The discussions resulted in the establishment of a "static" test of a draft methodology and rationale which used data taken from completed/closed contracts. Results of the static test were used in a presentation to the command group, from which approval to test the methodology and rationale dynamically was received. The "dynamic" test used data taken from open contracts. Again, the results of this test were presented to the command group and approval was received to implement the methodology in an operational mode.

III

STUDY METHODOLOGY

A. Regulatory Requirements

The Armed Services Procurement Regulations (ASPR) contain the basic guidance on the application of EPA clauses in procurement contracts; specifically, ASPR paragraph 3-404.3, Fixed Price Contract With Economic Price Adjustment, 1 Jul 79. It describes three broad types of EPA clauses:

1. Adjustment Based on Established Prices, where price adjustments are based on changes from an agreed upon level in published or established prices of either specific items or price levels of contract end items.

2. Adjustment Based on Labor or Material Costs (Actual Cost Method), where price adjustments are based on an increase or decrease in specified costs of labor or material actually experienced by the contractor during performance of the contract.

3. Adjustment Based on Labor or Material Costs (Cost Index Method), where price adjustments are based on an increase or decrease from specified labor or material cost standards or indices applicable to the contract.

Implementing regulations in the Army are generally permissive in nature, which is desirable because of the variation in procurement situations requiring individual judgment by the procuring contracting officers (PCO's) as to EPA application. This needed flexibility, according to a June 1978 study done by HQ, DARCOM (reference B), was understood when the ASPR coverage on EPA was written. The DARCOM study displayed statistics on DARCOM subordinate command usage of EPA clauses in FY 77. The study showed that, "On the average, these subordinate commands are committing 10-15 percent of total contract value for EPA. Some cases are less and a few are as high as 35 percent." The study further addressed the subject of ceilings in EPA clauses, and since some contracts are written with no upper limit, the study recommends that "... ceilings should be included particularly in view of the President's efforts to curb inflation."

B. Initial Approach/Findings

The initial approach was to examine a sample of 11 completed ARRCOM contracts and determine the following:

1. Similarities and differences between EPA clauses most frequently utilized at ARRCOM. (There are two types of EPA provisions. The first type is based on actual costs (Actual Cost Method), and the second is based upon cost indices (Cost Index Method). An estimated 94 percent of all EPA affected contracts are for ammunition, the majority of which are

of the Actual Cost Method type. From the sample drawn (see Table I) the EPA paid, expressed as a percent of the original contract price, ranged from 0.35% to 5.39%. Expressed as an average annual rate these values become 0.25% and 4.02%. The cost affected years (time duration of the contracts) ranged from 1.25 to 2.08 for an average of 1.53 years.)

2. Number of contracts with EPA clauses/set asides. (Approximately 230 ARRCOM ammunition contracts, both on-going and completed from program years FY 74-78 have EPA clauses.)

3. Frequency of EPA set aside amounts being breached. (The amounts of dollars set aside have always been in excess of the amounts paid in the sample drawn.)

4. Differences between EPA set aside amounts and actual payout amounts. (The PCO's had set aside an average of 9.2 percent of the contract value in the committed fund reserve to accomodate potential EPA payments on the eleven sample contracts. However, it was determined that on the average, only about 2.4 percent of the contract value had actually been paid out to the contractors. A major reason for the apparently low payoff is found in the manner in which EPA coverage was (and is) defined in contracts. EPA coverage is normally limited to a specified percentage of total labor or material and does not include other cost elements such as overhead, profit or fee. Therefore, if only that portion of the contract covered by the EPA clause was considered, the percentage paid would be much higher. Figure 1 shows this situation in graphic form. As can be seen, using a percentage of the total contract value yields a much larger reserve than using the same percentage against the smaller base of the EPA covered portion.)

5. Insight into the problem solution provided by contract data. (This study has resulted in two relatively diverse solutions to the EPA set aside problem. The first solution, Equation (1), provides a rule of thumb guide, which is an annualized EPA set aside rate. The rate can be applied against any contract price to determine the amount of EPA set aside. The second solution, equations (2) and (5), is slightly more complex, but provides for separate calculations of EPA set asides for each contract. These calculations are based upon the specific labor/standard industrial classification (SIC) codes and/or material/producer price indexes (PPI)* codes applicable to each contract. This latter solution requires periodic forecasts of labor and material indexes. The calculation process can be readily computerized. The first method/solution affords simplicity and a somewhat reduced set aside compared to current methods. The second method affords EPA set asides tailored to each individual contract, however, a technique for calculating confidence levels for this method is not obvious. The cost of implementation may be substantially higher for this second method; but the EPA set aside allocations appear to be much more in line with actual payout values (see Table II).)

*NOTE: Previously, Wholesale Prices and Price Indexes (WPI)

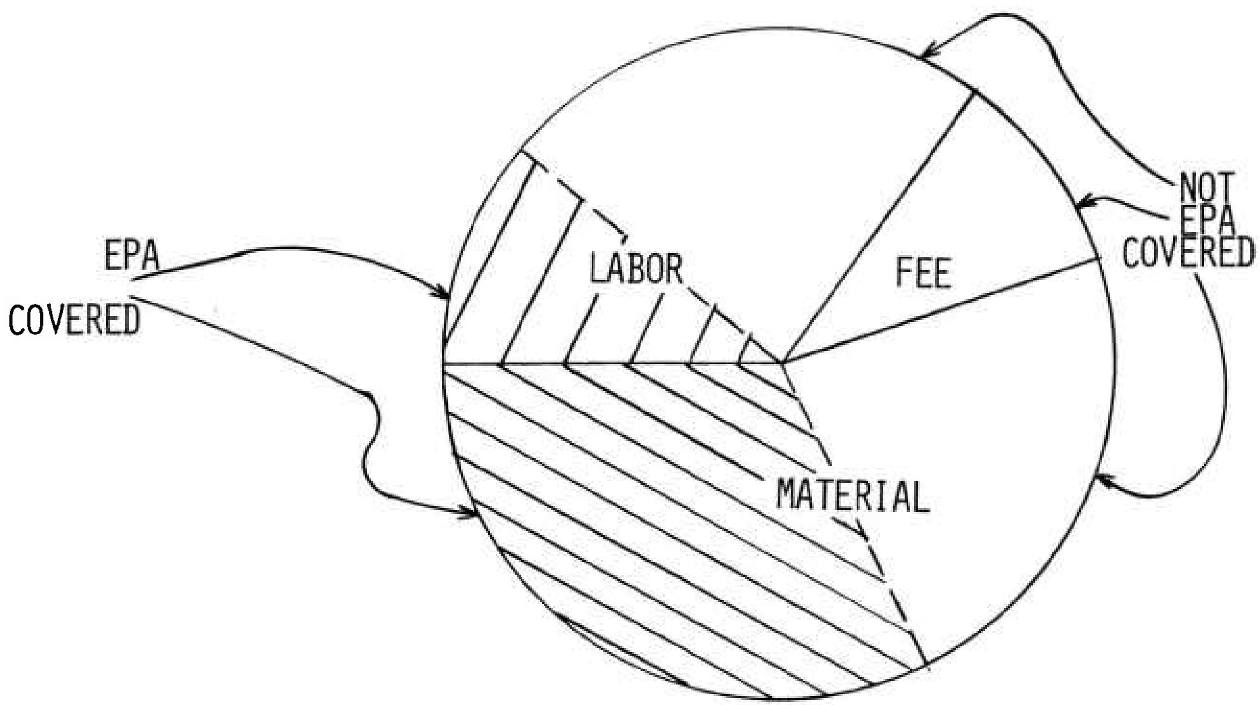
TABLE I

STATIC EPA SAMPLE DATA SET

FY	CATEGORY	EPA CLAUSE	AMT OF CONTRACT (THOUSANDS)	EPA SET ASIDE % OF TOTAL	EPA PAID % OF TOTAL	EPA PAID AV ANNL RATE %	COST AFFECTED YEARS
76	FUZE	L/M	$ 986	10	1.79	.97	1.83
76	FUZE	L/M	1,899	10	4.43	3.10	1.42
76	SMALL ARMS AMMO	L/M	850	10	2.41	1.92	1.25
76	SMALL ARMS AMMO	M	214	10	2.05	1.53	1.33
76	SMALL ARMS AMMO	M	1,231	10	4.18	2.48	1.66
76	SMALL ARMS AMMO	M	9,769	10	.47	.35	1.33
76	LARGE CAL AMMO, PROJ	L/M	5,159	10	.35	.25	1.42
76	LARGE CAL AMMO, PROJ	M	726	10	5.39	4.02	1.33
76	LARGE CAL AMMO, PROJ	L/M	384	8	1.69	1.07	1.58
75	LARGE CAL AMMO, PROJ	L/M	7,967	3.93	1.40	.67	2.08
74	LARGE CAL AMMO, CASE	L/M	4,315	9.13	2.73	1.71	1.58
	AVERAGE		$3,045	9.2	2.4	2.6	1.53

FIGURE I

CONTRACT EPA APPLICATION



TOTAL LABOR	-	35%	
TOTAL MATERIAL	-	55%	100% x 10% = EPA RESERVE OF 10%
FEE	-	10%	
EPA LABOR	-	11%	
EPA MATERIAL	-	32%	43% x 10% = EPA RESERVE OF 4.3%

TABLE II

STATIC COMPARATIVE DATA SET

($ IN THOUSANDS)

	EPA SET-ASIDE	ACT. METH. PROJ. EPA SET-ASIDE	GEN. METHOD PROJ. EPA SET-ASIDE 1/	EPA PAID	ACT. METH. THEOR. SURPLUS	GEN. METH. THEOR. SURPLUS
1	$ 99	$ 1	$ 62	$ 18	$(17)	$ 44
2	190	61	92	84	(23)	8
3	85	40	36	20	20	16
4	21	2	10	4	(2)	5
5	123	23	70	52	(29)	19
6	977	476	443	46	430	397
7	516	487	250	18	469	232
8	73	92	33	39	53	(6)
9	31	43	21	7	36	14
10	313	116	572	112	4	460
11	394	316	233	118	198	116
TOTAL	$2,281	$1,657	$1,823	$518	$1139	$1,305
AVG	$ 207	$ 151	$ 166	$ 47	$ 104	$ 119

1/ CALCULATED @ 3.39%/ANNUM.

6. Can an annual or overall EPA rate be formulated? (The sample of 11 contracts (representing fuses, small caliber ammunition, and large caliber ammunition commodities) was drawn from a population of approximately 230 contracts having EPA clauses. The sample data was ranked, plotted, and analyzed. It was determined that the sample contracts were not representative of a normal or log normal probability distribution. It best fit a Weibull distribution which is used to explain cases of extreme values (e.g., contracts with excessive EPA set asides). It was this distribution which served as the basis for computation of an annual EPA rate and has the added advantage in that it may be shaped and scaled by its parameters. After determining these parameters based upon the sample, the annual rates which would be sufficient a given percent of the time were computed. (See Figure II) Using these percentages as point estimates of annual rates, it was determined that with a level of confidence of 90% and 95% that an annual rate would be sufficient a given percentage of the time. Table I shows that the highest average annual EPA pay out rate was 4.02% Using the 4% as a starting point, we find from the Figure II graph that 4% set aside (annual rate) will be sufficient approximately 86% of the time with a confidence level of 95%.)

7. Can an approach tailored to each contract be formulated? (Since there are two types of EPA clauses, it was considered necessary to establish two tailored formulations. The formulation applicable to the Actual Cost Method (ACM) is similar to that of the Cost Index Method (CIM) with the latter being more detailed and specific. They both utilize the Bureau of Labor Statistics material and labor codes but apply them differently. The CIM is required to have a payout quarterly while the ACM is usually paid after contract finalization and audit.)

C. Current Method

As previously noted, it was found that PCO's were typically reserving 10 percent of the contract value for EPA purposes. A mathematical model of this method of calculating the amount of fund reserve can be expressed as follows:

$$EPA = P \times R$$

where:

EPA = amount of funds for set aside

P = total contract price

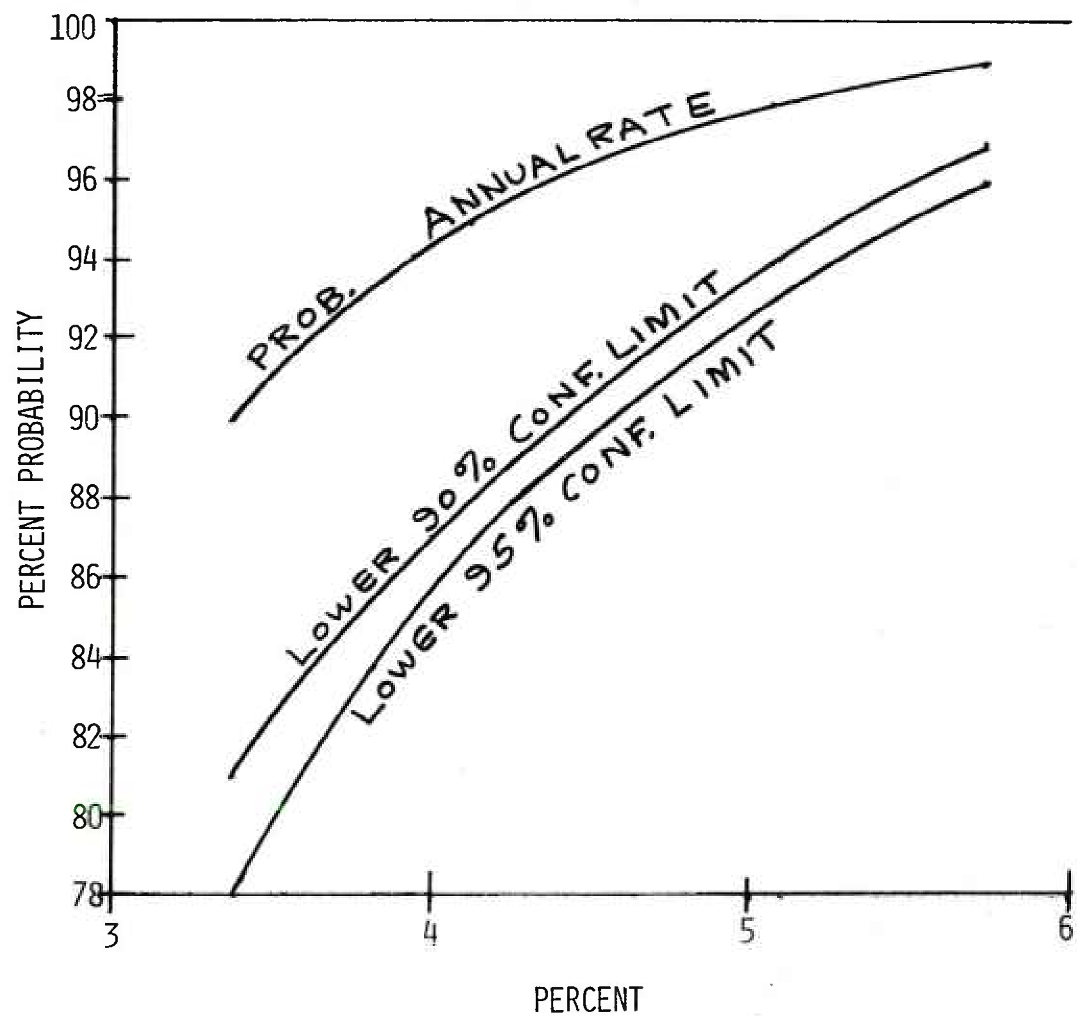
R = selected percentage rate

This model is wholly dependent upon the effectiveness of the selected percentage rate "R" as a predictor of the economic change. For "R" to be effective, the PCO must consider and include a number of factors, such as:

1. The time period for contract execution.

FIGURE II

EPA ANNUAL RATE



However, one would not be comfortable using this method without further investigation to assure that the basis is sound. Nevertheless, it is felt that a generalized approach has some merit and warrants added effort to assess its validity. There are other problems inherent in the use of a generalized method. If there are wide variations in the percentage of EPA coverage on contracts, then there will be wide variation in the amount of funds reserved. Some contracts will have just enough funds reserved, while others will have excessive funds reserved, and a very few will have insufficient funds reserved. By and large, the error will be on the conservative side and result in more funds being reserved than are needed. To avoid this conservatism, and to increase the precision of the estimate, more specific methods can be employed which are tailored to the type of EPA clause on given contracts.

2. Cost Index Method Model

Consider the application of the Cost Index Method on a contract where the EPA clause specifies the following:

a. The portion of contract labor to be considered for economic cost growth, expressed as a percentage of the total contract price.

b. The portion of contract material to be covered by economic cost growth, expressed as a percentage of the total contract price.

c. The "expenditure profile" for labor and material. Labor and material costs are incurred at various times during the contract period and have an effect on the cost due to inflation. Thus, the rates of expense for each are specified in the EPA clause. Typically, the expenditure profile is expressed in quarter year increments over the contract period.

d. The specific price indexes which will be used to measure changes in labor and/or material costs. Typically, these changes will be tied to a Bureau of Labor Statistics (BLS) index for one or more types of labor and/or material as appropriate to the given contract. A base index value for labor and/or material as of an agreed upon date is specified as the level from which price changes are measured.

A typical example of data specified on a contract using the Cost Index Method is shown at Fig. III, items 1 through 7. Given these data, a model constructed to be used to predict contingency fund requirements for individual contracts which use the Cost Index Method is as follows:

Cost Index Model for EPA Computation

$$\text{EPA(TOTAL)} = \text{EPA(LABOR)} + \text{EPA(MATERIAL)} \qquad \text{Equation (5)}$$

$$\text{EPA(LABOR)} = \sum^{q} \sum^{i} \sum^{y} \left[(L_p \times L_{qa}) \frac{L_{qi} - L_{bi}}{L_{bi}} \right] P_y \qquad \text{Equation (6)}$$

$$\text{EPA(MATERIAL)} = \sum^{q} \sum^{i} \sum^{y} \left[(M_p \times M_{qa}) \frac{M_{qi} - M_{bi}}{M_{bi}} \right] P_y \qquad \text{Equation (7)}$$

FIGURE III

Typical Data Set

COST INDEX METHOD

Contract Period

Data Element	Quarters 1	2	3	4	Total
1. Contract Price					$ 4,853K
2. Contract % - Labor EPA					11%
3. Expenditure Profile Labor	9%	29%	32%	30%	100%
4. Contract % - Mat'l EPA					32%
5. Expenditure Profile Material	21%	31%	32%	16%	100%
6. Base Index - Labor					5.227
7. Base Index - Mat'l					225.0
8. Forecast Index Labor	5.293	5.398	5.503	5.610	
9. Forecast Index Material	230.3	235.3	240.2	245.1	

where:

q = quarter

i = index

y = year

L_p/M_p = percent of contract price covered by EPA labor/material

L_{qa}/M_{qa} = allocation of L_p/M_p by quarter (expenditure profile)

L_{qi}/M_{qi} = forecasted quarterly index value for labor/material

L_{bi}/M_{bi} = base index value for labor/material

P_y = contract price by program year

The real key to the use of this model is that forecasted index values must be provided for the prescribed labor/material indices. In other words, changes from the base index value(s) specified in the contract must be predicted. It is recognized that prediction cannot be done with absolute precision but it is believed that it can be done effectively and with relative ease. One method of prediction is the use of time series analysis. Many of the BLS indices are relatively stable and are not given to wide variation. Therefore, time series analysis provides reasonably accurate estimates of index movements. In other cases, specific judgments may be applied when economic factors are likely to cause extremes in price index changes.

A graphic illustration of how this can be done is shown at Fig IV. It shows a trend line fitted to two years (24 months) of data from BLS labor index, Standard Industrial Classification (SIC) Code 1929, Ammunition except Small Arms. This particular SIC Code was specified in the contract data shown at Fig. III. As can be seen, the index shows a relatively stable trend over the 24 month period and the solid trend line has been extended for about 16 months into the future. Dashed lines have been added and extended into the forecast period to indicate judgments which could be applied to account for expected economic impacts. The same technique was also applied to the BLS material index specified in the sample contract. As a result, predicted index values were derived for the contract execution period and are as shown at Fig. III, items 8 and 9.

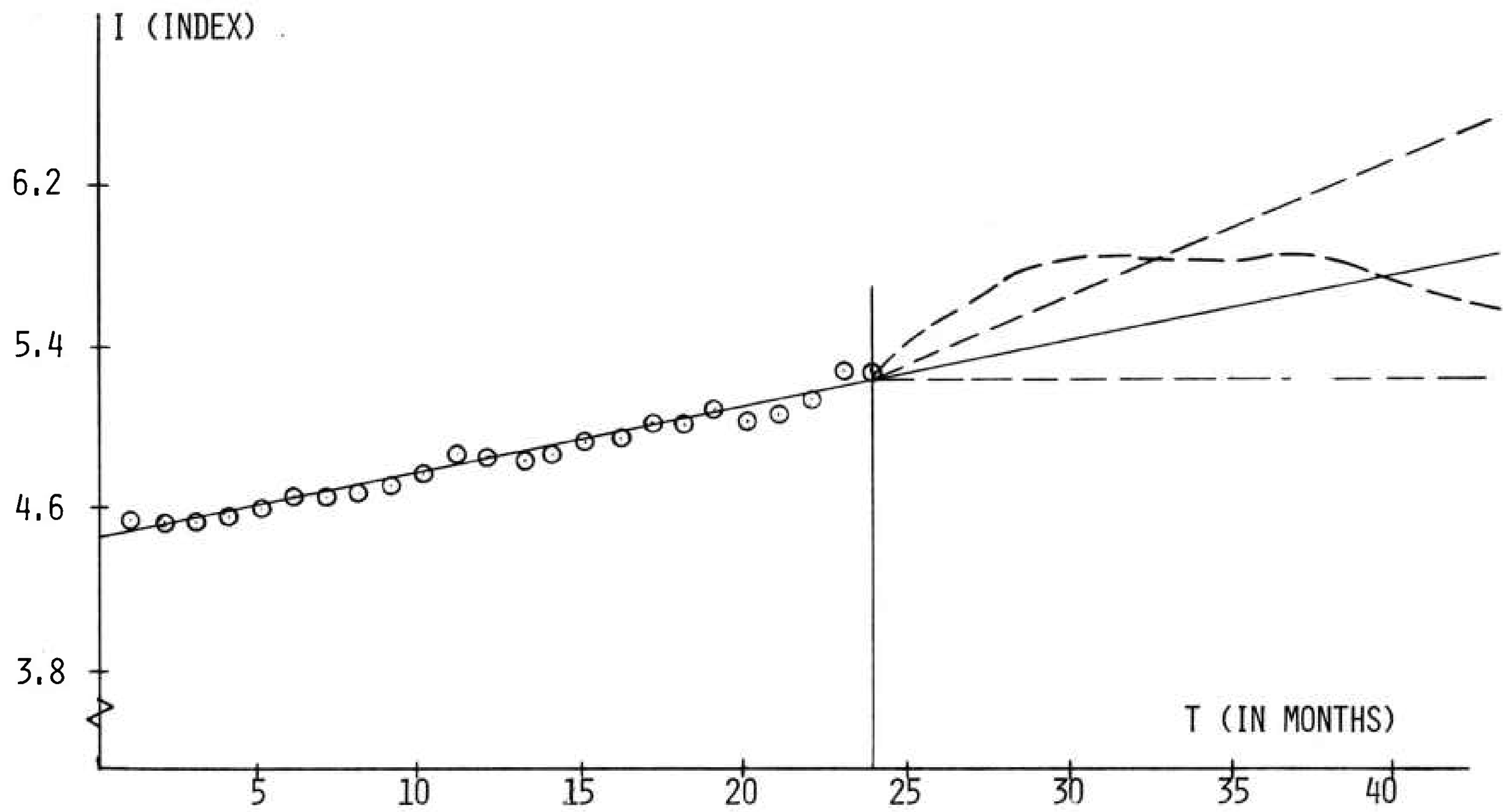
Using the data from Fig. III in the Cost Index Model, the following results were obtained:

$$\begin{aligned} \text{EPA (Total)} &= \text{EPA (Labor)} + \text{EPA (Material)} \\ &= \$26K + \$86K \\ &= \$112K \end{aligned}$$

FIGURE IV

LABOR INDEX FORECAST

SIC CODE 1929



The resulting \$112K recommended reserve can be compared with the actual amount reserved using current methods.

$$\text{EPA (Total)} = \text{Contract Price} \times 10\%$$

$$= \$4{,}853K \times .10$$

$$= \$485K \text{ (Actual reserve)}$$

As can be seen, a reduction of \$373K in reserve funds would have been achieved using the Cost Index Model. Instead of reserving 10 percent of the contract value, only about 2.3 percent would have been reserved -- a significant reduction.

It is not proposed that this technique be used at the inception of the contract to determine EPA reserves and then be forgotten until payments are made. That would not be prudent reserve fund management. It is believed that the BLS index changes should be monitored and new calculations made at least quarterly. A quarterly review would be consistent with contract EPA payment practices and should allow for ready detection and adjustment of variations.

e. In summary, the key provisions of Cost Index Model use are:

(1) Based on specific contract provisions.

(2) Based on specific cost index(es).

(3) Requires forecast of index values.

(4) Permits variance in expected rate of inflation.

(5) Covers both labor and material EPA.

(6) Calculation is simple and could easily be automated.

(7) Requires periodic monitoring.

3. ACTUAL COST METHOD MODEL

For contracts specifying the Actual Cost Method of calculating EPA payments, the same general approach for computing reserve funds can be used. However, the basic requirements are in different terms than the Cost Index Method and a somewhat different calculating model is required. Such a model has been constructed; and, as in the Cost Index Method, the calculations are simple but extensive.

a. Actual Cost Model for EPA Computation

$$\text{EPA (TOTAL)} = \text{EPA (LABOR)} + \text{EPA (MATERIAL)} \qquad \text{Equation (2)}$$

$$\text{EPA(LABOR)} = \sum^{y} \sum^{b} \left[[L_b (L_e - 1)] (1 + L_f) \right]_y \qquad \text{Equation (3)}$$

$$\text{EPA(MATERIAL)} = \sum^{y} \sum^{b} [M_b (M_e - 1)]_y \qquad \text{Equation (4)}$$

where:

y = contract period in years

b = base costs as specified in contract

L_b/M_b = labor/material base cost

L_e/M_e = labor/material cost estimate factor

L_f = labor fringe benefits

All terms used in this model are specified in the contract except the "Labor/ Material Cost Estimate Factor" which will be discussed shortly. An example of data specified in a typical contract is shown at Fig. V, items 1 through 4. The "Contract Period" covers the time of the contract execution, from contract signing to final delivery, as cited for the General Model. The "Base Contract Costs" form the price level for that part of the contract to be measured for EPA payments. These costs are specified in the contract by individual labor operation and individual component prices, as shown at Fig. VI for our example contract. As can be seen, the costs to be measured are \$260K for labor and \$740K for material for a total of \$1,000K. This equates to about 53 percent of the total \$1,900K contract value.

The "Cost Estimate Factor" is a key element in the use of this model and can be likened to the Forecast Index value used in the Cost Index Model. The "Factor" is an estimate of the price changes to be expected on the measured portion of the contract, (see Fig. V, item 5). It can be derived in several ways. One way is to simply apply a value based on best judgment of how much the measured prices may change, e.g., 7 percent per annum. A better method is to analyze the measured cost elements and assign a proxy yardstick from the BLS index inventory. For this example, proxy yardsticks were assigned using SIC Code 192 and PPI Code 108. Then, changes anticipated in the price index level can be estimated using the methodology already described for the Cost Index Method. For this example, the changes worked out to an estimated 17 percent increase for labor and 1 percent for material over the 1.42 year contract period.

FIGURE V

Sample Data

Actual Cost Method

	Data Element	Labor	Material
1.	Contract Period (Years)	1.42	1.42
2.	Base Contract Costs (Schedule of EPA Effected Labor/Matl)	$260K	$740K
3.	Labor Fringe	16.8%	
4.	Total Contract Price		$1,900K
5.	Cost Estimate Factor	1.17	1.01

FIGURE VI

Basic Data

Actual Cost Method

Cost Element	Cost/Unit	No. Units	Total
Labor:	$ .052055	5M	$ 260K
Assembly	(.040480)		
Inspect & Test	(.005330)		
Pkg & Pack	(.006245)		
Material:	$ .147903	5M	$ 740K
Pin	(.007962)		
Screw	(.030945)		
Spring	(.002047)		
Clip	(.003824)		
Slide	(.040612)		
Weight	(.011409)		
Housing	(.032249)		
Cover	(.012205)		
Pkg & Pack	(.005550)		
Misc.	(.001100)		

Upon examination, it was intuitively considered that the labor increase was reasonable and the material increase to be grossly understated. However, to make a point, no judgmental adjustments based on the state of the economy have been made.

Therefore, using the input data shown at Fig. V in the Actual Cost Model results in the following estimates of reserve fund requirements:

EPA (Total) = EPA (Labor) + EPA (Material)

= $51K + $10K

= $61K

Compare that reserve requirement with the actual amount reserved on the contract using current methods.

EPA (Total) = Contract Price x 10%

= $1900K x .10

= $190K

It can be seen that a reduction of $129K would have been attained using the Actual Cost Model. However, as noted, no adjustments were made to the material cost factor which appeared to be grossly understated, and is borne out by the fact that on this contract, the actual EPA payments amounted to $84K. Therefore, the estimated (unadjusted) value of $61K would not have been sufficient; but, the $190K reserved using current methods resulted in having too much money committed.

Nonetheless, the overall technique of using the Actual Cost Model as a predictive tool appears to have merit. However, as with the Cost Index Model, it should not be applied at contract inception without subsequent periodic monitoring to assure that any erratic variation is detected and adjustments made in the reserve fund as needed. It is believed that this can easily be done with minimal resource application.

b. In summary, the Actual Cost Model:

(1) Is based on specific contract provisions.

(2) Is based on specific labor and material elements.

(3) Requires a forecast of price level changes.

(4) Permits a variance in expected rate of inflation.

(5) Covers labor and material component prices.

(6) Is simply calculated - could easily be automated.

(7) Requires periodic monitoring of results.

E. Application

1. Test

Based upon the results of the "static" test, authorization to perform a "dynamic" test was given by the ARRCOM Commander in Oct 78. The test was conducted in accordance with the test plan (see Appendix A) except that it was reduced to run for six months rather than a full year. The following test conditions applied:

a. Contracts were a representative selection of all EPA methods in use by HQ, ARRCOM. Approximately 80-85% were of the actual cost type, and 15-20% the cost index type.

b. Contracts were representative of all types of commodities.

c. Of the actual cost type contracts, at least 50% of them were to have all EPA payments made by the end of Apr 79.

d. Of the cost index type contracts, all were expected to have some payments due in the Oct 78 - Apr 79 period.

e. Contracts selected represented the range and distribution of dollars typical of EPA contracts.

f. The PCO's were not required to comply with the recommendations regarding committed EPA funds since part of the purpose of the "dynamic" test was to show the difference between the recommendations and actual practice.

2. Contract Selection

Twenty-nine contracts were selected from the Procurement Aging and Staging System (PASS) computer data bank, four cost index type and twenty-five actual cost type. These contracts represented a variety of ammunition items (fuse, projectile, cartridge case, bomb, etc), fire control, and some miscellaneous items (links and ammunition boxes). There were no active weapon contracts. Of the actual cost type contracts, only one was found which would have all EPA payments made by the end of Apr 79; and of the cost index type contracts, all had one or more EPA payments made by Apr 79. The contract prices ranged from 0.4 to 32.4 million dollars with a mean value of 7.1 million dollars.

3. Cost Index Method

Displayed in Fig. VII are the initial projection for EPA fund retention requirements and seven quarterly updates for a specific contract wherein the EPA clause addressed both labor and material. Also shown are the actual quarterly payments made and the amount the projections

FIGURE VII

QUARTERLY PROJECTED EPA PAYOUT REQUIREMENTS

Contract		Initial Projection	PERIODIC UPDATE PROJECTIONS 1	2	3	4	5	6	7	Actual Paid	Over or (under) Estimated
		$	$	$	$	$	$	$	$	$	$
Labor											
Qtr	1	6813								6652	161
	2	12489	12436							13396	(960)
	3	18493	18385	18868						20049	(1181)
	4	24496	24389	25139	25032					28990	(3958)
	5	30607	30446	31518	31143	33501				34147	(646)
	6	26352	26237	27236	26736	28772	29886			28185	1701
	7	30770	30655	31999	31193	33613	35149	33958		35483	(1525)
	8	26243	26158	27415	26558	28616	30188	28988	28988	30789	(1801)
TOTAL		176,263	168,706	162,175	140,662	124,502	95,223	62,946	28,988	197,691	(8,209)
Material											
Qtr	1	16485								21330	(4845)
	2	37129	46649							36151	10498
	3	71216	87937	86698						83551	3147
	4	76864	92836	92836	86846					71406	15440
	5	77197	92877	93279	87248	78403				92879	(14476)
	6	75052	89610	90257	84434	75699	104167			102550	1617
	7	75422	89841	90673	84850	75699	101210	108974		101764	7210
	8	15912	18860	19114	17742	15912	20690	22520	20589	20995	(406)
TOTAL		445,277	518,610	472,857	361,120	245,713	226,067	131,494	20,589	530,626	18,185
Contract Total		621,540	687,316	635,032	501,782	370,215	321,290	194,440	49,577	728,317	9,976

were over or under ( ) estimated. The net result is that the sum of the projected fund requirements computed over the life of the contract exceeded actual requirements by $9,976 or 1.37%.

Typically, the values shown in Fig. VII are obtained from the results of the cost index model, equation (5). One of the inputs to this equation mentioned but not discussed in detail, is the forecasted quarterly index value for labor/ material denoted by L_{qi}/M_{qi}. Since the means used in this study for obtaining these forecasted values is identical for both labor and material, only material will be discussed; and, for reasons which will become obvious later, only the fifth quarter (fourth periodic update) values shown in Fig. VII will be developed. The sequence of events resulting in these values are as follows:

a. Prediction equations are developed from a computer program which analyzes two variable data and selects the best fit regression equation from a series of 12 regression equation options (including linear, geometric, logarithmic, and other transforms). Input to the computer program are the material index values - reported in the Producer Prices and Price Indexes published monthly by US Department of Labor, Bureau of Labor Statistics (BLS) - for each of the 24 months just preceding the period requiring projected index values. The coefficients (A, B, etc.) of each of these equations together with their coefficients of determination and variation are provided as program output. That equation having the highest coefficient of determination, the lowest coefficient of variation and an otherwise reasonable shape or configuration is selected and used as the basis for calculating the projected index values. This procedure is shown on the following figures: Fig. VIII a. shows the material index values for the 24 month period, Jan 76-Dec 77, plus the material index predictions for the 25th - 36th months resulting from the use of the selected equation, form 3, shown on Fig. VIII b. In Fig. VIII c. the actual 24 months data (shown as x's) is compared to the plot points of the equation, form 3. The mean of each successive three monthly projections is used as the forecasted quarterly index value for material (M_{qi})

Using equation (7)

$$\text{EPA(MATERIAL)} = \sum^{q} \sum^{i} \sum^{y} \left[(M_p \times M_{qa}) \frac{(M_{qi} - M_{bi})}{M_{bi}} \right] P_y$$

and the following data

Qtr	M_p	M_{qa}	M_{qi}	M_{bi}
5	.66	.1318	239.6	220.1
6	.66	.1061	243.5	220.1
7	.66	.0909	247.4	220.1
8	.66	.0167	251.4	220.1

P_y = $10,171,800

FIGURE VIIIa

WPI Code - 101

Jan '76 thru Dec '77

4th Update

REGRESSION ANALYSIS - TWO VARIABLES

SCREENING PROGRAM

INPUT DATA

X VALUE (Month)	Y VALUE (Index)
1.0000	206.1000
2.0000	209.7000
3.0000	211.4000
4.0000	213.3000
5.0000	213.3000
6.0000	218.2000
7.0000	220.1000
8.0000	219.9000
9.0000	218.8000
10.0000	218.8000
11.0000	218.9000
12.0000	222.6000
13.0000	224.2000
14.0000	224.7000
15.0000	227.3000
16.0000	228.2000
17.0000	227.9000
18.0000	226.9000
19.0000	232.1000
20.0000	233.1000
21.0000	235.7000
22.0000	234.2000
23.0000	233.4000
24.0000	235.5000

	Projections	Mean
25	238.3	
26	239.6	239.6
27	240.9	
28	242.2	
29	243.5	243.5
30	244.8	
31	246.1	
32	247.4	247.4
33	248.8	
34	250.1	
35	251.4	251.4
36	252.8	

FIGURE VIIIb

FORM 1 Y = A+BX

A = 208.20615
B = 1.19117

COEFFICIENT OF DETERMINATION : .95794
COEFFICIENT OF VARIATION : .00808

FORM 2 Y = A+B(LN X)

A = 200.82452
B = 9.75657

COEFFICIENT OF DETERMINATION : .88647
COEFFICIENT OF VARIATION : .01328

FORM 3 LN Y = A+BX

A = 5.33992
B = .00535

COEFFICIENT OF DETERMINATION : .95511
COEFFICIENT OF VARIATION : .00155

FORM 4 Y = 1/(A+BX)

A = .00479
B = -.00002

COEFFICIENT OF DETERMINATION : .95150
COEFFICIENT OF VARIATION : .00876

FORM 5 $Y = AX^B$

A = 201.54147
B = .04419

COEFFICIENT OF DETERMINATION : .89685
COEFFICIENT OF VARIATION : .00235

FORM 6 SQRT Y = A+BX

A = 14.43452
B = .03993

COEFFICIENT OF DETERMINATION : .95662
COEFFICIENT OF VARIATION : .00411

FORM 7 Y = A+B(SQRT X)

A = 197.93203
B = 7.48980

COEFFICIENT OF DETERMINATION : .95806
COEFFICIENT OF VARIATION : .00807

FORM 8 SQRT Y = A+B(SQRT X)

A = 14.08869
B = .25151

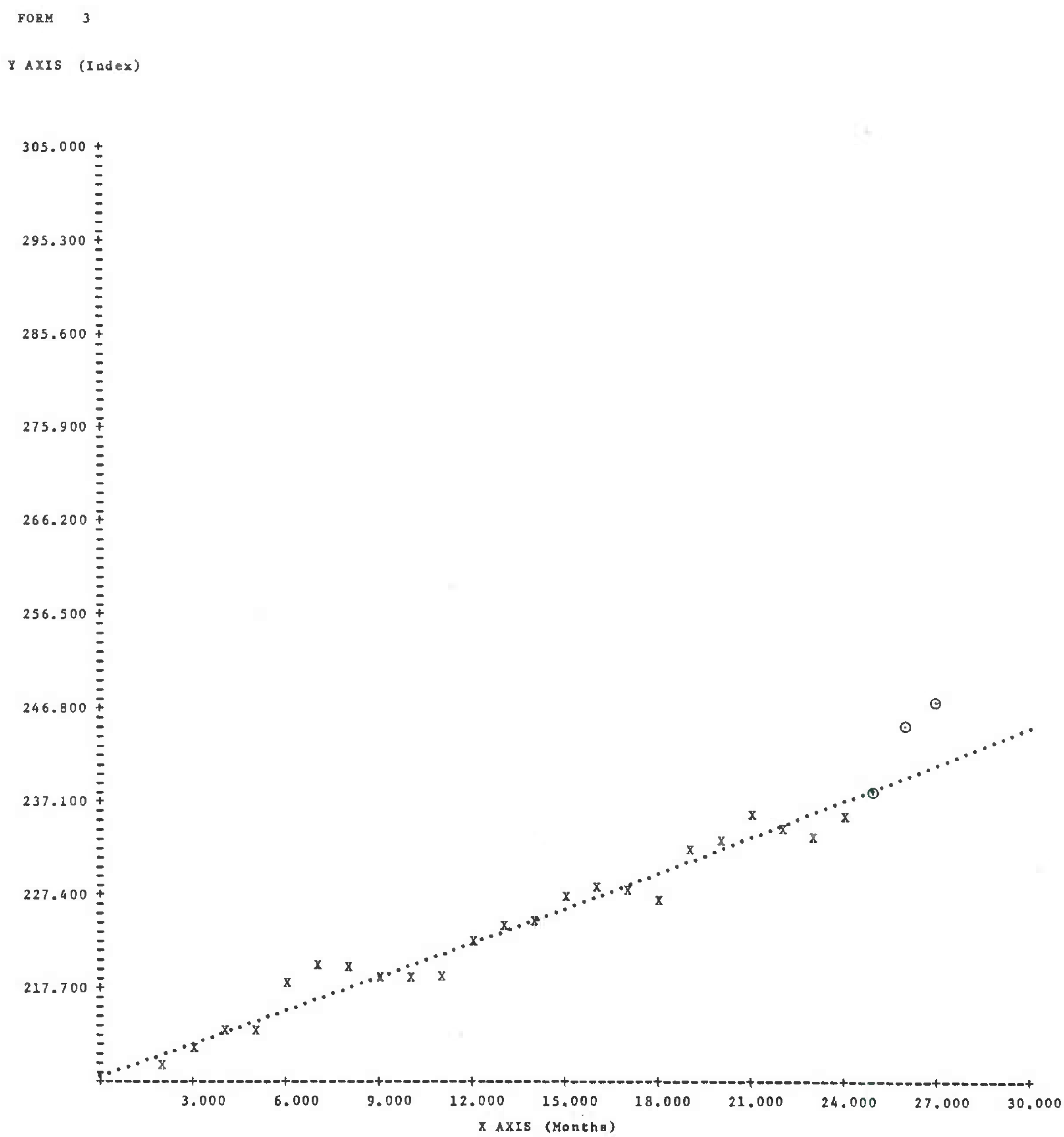
COEFFICIENT OF DETERMINATION : .95987
COEFFICIENT OF VARIATION : .00395

FORM 9 $Y^2 = A+BX$

A = 43214.53713
B = 530.25499

COEFFICIENT OF DETERMINATION : .95999
COEFFICIENT OF VARIATION : .01570

FIGURE VIIIc



where:

M_p = percent of contract price covered by EPA

M_{qa} = allocation of Mp by quarter (expenditure profile)

M_{qi} = forecasted quarterly index value for material

M_{bi} = base index value for material as specified by the contract

P_y = contract price by program year

the fourth periodic update projections for contract quarters 5, 6, 7, and 8 result in the following;

$$EPA_5 = (.66 \times .1318)\ \frac{(239.6 - 220.1)}{220.1}\ (10{,}171{,}800) = \$78{,}403$$

$$EPA_6 = (.66 \times .1061)\ \frac{(243.5 - 220.1)}{220.1}\ (10{,}171{,}800) = \$75{,}699$$

$$EPA_7 = (.66 \times .0909)\ \frac{(247.4 - 220.1)}{220.1}\ (10{,}171{,}800) = \$75{,}699$$

$$EPA_8 = (.66 \times .0167)\ \frac{(251.4 - 220.1)}{220.1}\ (10{,}171{,}800) = \underline{\$15{,}912}$$

Total Fourth Periodic Update $245,713

(Note that contract language specifies computational requirements to preclude errors due to rounding.)

b. When the BLS data became available to make the next (in this case, the fifth) periodic update, the following practice was applied. Upon comparing the EPA_5 value of $78,403 to $92,879, the amount actually paid (see Fig. VII) the estimate is found to be low by $14,476 or 18.5%. Adding the actual values for the plot points for the 25th, 26th, and 27th months to Fig VIII c (denoted by "0"), it can be seen that the last two points are well above the curve, driving the mean value for this quarter period much higher than estimated causing the EPA_5 payment to be as high as it is. To preclude future estimating errors of this magnitude, especially under estimates, all data were examined and analyzed for, but not limited to, cyclical and/or seasonal patterns as well as trends, tendencies, and amplitude fluctuations. Based upon this analysis the material index was found to have risen from 234.4 in the fourth quarter to 243.2 in the fifth quarter for an increase of 3.75%, and it is considered reasonable to assume, based on prior cyclical fluctuations, that a similar increase will occur between the fifth and sixth quarters.

Additionally, a regression analysis for the fifth periodic update produces projected sixth, seventh, and eighth quarter mean index values of 244.6, 248.7, and 252.8 respectively, all of which appear to be too low in light of past experience.

Furthermore, the coefficients of the equation (form 3) used to calculate these index values, are almost identical to those of the equation (form 3) used in the fourth periodic update. It was further noted that the last two historical plot points shown on Fig VIII c (denoted by "0"), also lie well above the curve generated by the fifth periodic update regression. All this reaffirms the need for an upward adjustment to the previously determined sixth, seventh, and eighth index projections.

c. To apply the 3.75% increase previously mentioned, to these projections directly would, it is felt, tend to overcompensate, therefore, a normalizing factor was applied. The difference between the estimated sixth quarter (fifth periodic update) projected index value of 244.6 and the fifth quarter historical index value of 243.2 is 1.4. Subtracting this difference from each of the three projected fifth periodic update quarter index values will adjust them all to a common base and reduce the chance of overestimating. These projected values for Mqi to be used in equation (7) become:

6th qtr: (244.6 - 1.4) (1.0375) = 252.3

7th qtr: (248.7 - 1.4) (1.0375) = 256.6

8th qtr: (252.8 - 1.4) (1.0375) = 260.8

and the resulting EPA fund retention projections are:

EPA_6 = $104,167

EPA_7 = 101,210

EPA_8 = 20,690

TOTAL $226,067

A similar approach was applied to the sixth periodic update but not to the seventh. Results are presented in Fig. VII.

4. Actual Cost Method

Much of what was discussed regarding the Cost Index Method is applicable here except that instead of having to make monthly projections, only single projections are required. These projections are of the proxy yardsticks, the selection of which is discussed below as well as their use in making projections.

a. The selection of a proxy yardstick, as used herein, is relatively simple. It was decided to utilize the material and labor indexes published by the Bureau of Labor Statistics because of their structure, availability, and since they are already being used with the Cost Index Method. As an example of application, consider a contract for the M548 ammunition box. Now, from both the item description and the schedule of material (sheetmetal components) submitted by the contractor as being EPA effected, it was determined that a suitable selection of material index would be PPI-1013-Steel Mill Products. This is a relatively general index category as compared to more specific indexes, such as, PPI-1013-0259.03-Sheets, H.R. Carbon, Coil, or PPI-1013-0261.03-Sheets, H.R., Carbon. Since the index selection is not the contractors, but the analysts, and based upon limited information, it is considered best to select the more general index - it is better to be reasonably correct rather than precisely wrong. Likewise an index selected for labor was the Standard Industrial Classification (SIC) for Fabricated Metal Products - Metal Forgings and Stampings, SIC-346. These indexes are also published monthly in the Employment and Earnings report of the BLS.

b. Calculation of the amount of labor EPA funds to be recommended for retention on the aforementioned contract for the M548 ammunition box would use the following contract data and equation 2:

(1) Contract award date - Jul 77

(2) Date of final delivery - Dec 78

(3) The unit cost of the labor base is specified as $1.0725 in the contract.

(4) The unit cost of the material base is specified as $5.0298 in the contract.

(5) The labor fringe benefits are specified as being 26.07% of direct labor.

(6) The number of units, as specified in the contract, is 293,189.

From the above the following inputs to equation 2 are generated:

$$L_b = (\$1.0725)(293{,}189) = \$314{,}445$$

$$M_b = (\$5.0298)(293{,}189) = \$1{,}474{,}682$$

$$L_f = 0.2607$$

$$L_e = \left(\frac{7.34}{6.73}\right)^{1.4} = (1.0906)^{1.4} = 1.1291$$

$$M_e = \left(\frac{248.4}{228.9}\right)^{1.4} = (1.0852)^{1.4} = 1.1213$$

Obviously, the numbers used above to produce the values shown for L_e and M_e need some explaining. The number 1.4 is the seventeen month period (Jul 77 - Dec 78) divided by twelve. This is the period, the cost affected years, over which an average annual rate of change in index values would compound to. The index values were derived as described under the Cost Index Method using the regression analysis - two variable screening program. The values shown above are for Jul 78 divided by the value for Jul 77 for each index as appropriate. The resulting initial projection for EPA fund retention from equation 2 is:

$$EPA = (\$314,445)\ (1.1291 - 1.0)\ (1 + 0.2607) + (\$1,474,682)\ (1.1213 - 1.0)$$

$$= \$51,178 + \$178,879 = \$230,057$$

Each succeeding quarter update advances this twelve month period index ratio by three months (e.g., the next quarter would be Oct 78 divided by Oct 77) until Dec 78 is reached, and then each quarter update becomes the ratio of the Dec 78 projected index value divided by the Dec 77 actual index value until the Dec 78 actual index value is known. For the last quarterly update to the above, the total recommended retention of EPA funds came to \$282K as shown in Fig XII, line 5.

IV

STUDY RESULTS

The results of this study are based upon an initial "static" test and a follow on "dynamic" test. The "static" test was performed to determine the potential for the release of committed contingency funds, how much this would average per contract, an estimate of the resources required, and which model is the better predictor.

From the "static" test, it was determined that approximately $100,000 per contract could be released from the EPA committed category for use elsewhere. Additionally, it was felt that use of the projection models would not require increased resources. Finally, it was decided that the actual cost model (equation 2), and the cost index model (equation 5) resulted in better estimates of the amount of EPA funds to be reserved. This information was presented to the HQ, ARRCOM command group and permission to run a "dynamic" test was granted.

The "dynamic" test was initiated in late Oct 78 and included an initial EPA set aside projection, plus two quarterly updates for each of 29 contracts. Four of these contracts used the Cost Index Method, and the remaining 25 used the Actual Cost Method in applying EPA. The results of the "dynamic" test delineated above are exhibited in Figures IX through XV. These results show that, had the Procurement Directorate been required to comply with the recommendations regarding committed EPA funds, that 7.8 million dollars would have been made available for alternate investment opportunities. Even following the recommendations due to the General Model would have made approximately 3 million dollars available for other investment opportunities. The general model projections are shown for reference and comparison.

Also, use of the projection models will not significantly increase the risk of an over obligation of funds, an RS 3679 violation (Section 3679 of the Revised Statutes, as amended - 31 U.S.C. 665). Model usage will provide for prompt identification of excesses in committed funds, as well as unobligated contingency funds or potential fund shortages on an individual contract basis. Additionally, the models will provide a consistent, supportable rationale for the management and retention of EPA reserves.

Since the methodology is not organizationally unique, it can be applied by any organization using EPA clauses in procurement contracts.

FIGURE IX

COST INDEX METHOD - SHIPPED
$ IN THOUSANDS

	AMT OF CONTRACT	EPA SET ASIDE	EPA PAID	EPA PROJECTION	PROJECTED REDUCTION	VARIANCE %	GEN MODEL PROJECTION OR CEILING PRICE *
1	10,172	1,017	728	738	279	1.37	1,017 *
2	32,424	3,454	2,783	2,745	709	- 1.36	3,454 *
	TOTAL						
	42,596	4,471	3,511	3,483	988		4,471 *

* IN ACTUAL PRACTICE, IF RECOMMENDED PROJECTION EXCEEDS CEILING PRICE, ONLY CEILING PRICE WOULD BE SET ASIDE.

FIGURE X

COST INDEX METHOD - OPEN

$ IN THOUSANDS BY PROGRAM YEAR

	AMT OF CONTRACT	EPA SET ASIDE	EPA PAID	EPA PROJECTION	PROJECTED REDUCTION	VARIANCE %	GEN MODEL PROJECTION OR CEILING PRICE*
1	4,853	485	146	184	301	26.03	
	6,601	660	176	524	136		
	11,454	1,145	322	708	437		1,120
2	2,281	342	3	213	129		
	1,988'	398		189	209		
	5,044	1,261		651	610		
	9,313	2,001	3	1,053	948		1,208
TOTAL	20,767	3,146	325	1,761	1,385		2,328

*IN ACTUAL PRACTICE, IF RECOMMENDED PROJECTION EXCEEDS CEILING PRICE, ONLY CEILING PRICE WOULD BE SET ASIDE.

FIGURE XI

PROJECTED RESULTS

COST INDEX METHOD

$ IN THOUSANDS

	AMT OF CONTRACT	EPA SET ASIDE	EPA PAID	EPA PROJECTION	PROJECTED REDUCTION	GEN MODEL PROJECTION OR CEILING PRICE*
SHIPPED (2)	42,596	4,471	3,511	3,483	988	4,471 *
OPEN (2)	20,767	3,146	325	1,761	1,385	2,328
TOTAL	63,363	7,617	3,836	5,244	2,373	6,799

* IN ACTUAL PRACTICE, IF RECOMMENDED PROJECTION EXCEEDS CEILING PRICE, ONLY CEILING PRICE WOULD BE SET ASIDE.

FIGURE XII

ACTUAL COST METHOD - SHIPPED

$ IN THOUSANDS

	AMT OF CONTRACT	EPA SET ASIDE	EPA PAID	EPA PROJECTION	PROJECTED REDUCTION	VARIANCE %	GEN MODEL PROJECTION OR CEILING PRICE*
1	11,369	1,137		52	1,085		1,137*
2	5,161	516		250	266		516*
3	4,957	496		127	369		465
4	2,521	214		151	63		197
5	2,876	288	212	282	6	33.02	181
6	404	40		16	24		12
7	1,989	196		45	151		88
	29,277	2,887	212	923	1,964		2,596

*IN ACTUAL PRACTICE, IF RECOMMENDED PROJECTION EXCEEDS CEILING PRICE, ONLY CEILING PRICE WOULD BE SET ASIDE.

FIGURE XIII

ACTUAL COST METHOD - OPEN

$ IN THOUSANDS

	AMT OF CONTRACT	EPA SET ASIDE	EPA PROJECTION	PROJECTED REDUCTION	GEN MODEL PROJECTION OR CEILING PRICE*
1	2,108	352	105	247	250
2	1,458	145	146	(1)	120
3	3,577	349	524	(175)	121
4	5,496	404	194	210	262
5	996	100	83	17	94
6	906	90	81	9	43
7	19,642	1,964	728	1,236	1,921
8	10,259	536	309	227	536*
9	1,274	127	87	40	75
10	1,630	158	134	24	121
11	2,917	292	290	2	150
12	17,096	1,710	970	740	1,272
13	3,520	352	108	244	168
14	2,229	223	184	39	132
15	3,665	366	390	(24)	366*
16	4,450	432	70	362	212
17	1,202	120	38	82	31
18	30,588	1,529	2,569	(1,040)	1,529*
	131,013	9,249	7,010*	3,479	7,409

Numbers in ( ) non-adds

* In actual practice, if recommended projection exceeds ceiling price, only ceiling price would be set aside. EPA projection would be thus reduced to $5,770.

FIGURE XIV

PROJECTED RESULTS
ACTUAL COST METHOD
$ IN THOUSANDS

	AMT OF CONTRACT	EPA SET ASIDE	EPA PAID	EPA PROJECTION	PROJECTED REDUCTION	GEN MODEL PROJECTION OR CEILING PRICE*
SHIPPED (7)	29,277	2,887	212	923	1,964	2,596
OPEN (18)	111,626	9,249	0	5,770	3,479	7,409
	140,903	12,136	212	6,693	5,443	10,005

* IN ACTUAL PRACTICE, IF RECOMMENDED PROJECTION EXCEEDS CEILING PRICE, ONLY CEILING PRICE WOULD BE SET ASIDE.

FIGURE XV

TOTAL PROJECTED RESULTS

$ IN THOUSANDS

	AMT OF CONTRACT	EPA SET ASIDE	EPA PAID	EPA PROJECTION	PROJECTED REDUCTION	GEN MODEL PROJECTION OR CEILING PRICE*
SHIPPED (9)	71,873	7,358	3,723	4,406	2,952	7,067
OPEN (20)	132,393	12,395	325	7,531	4,864	9,737
TOTAL (29)	204,266	19,753	4,048	11,937	7,816	16,804
% OF SET ASIDE		100.0%		60.4%	39.6%	85.1%
APPROX % OF CONTRACT		10.0%		6.0%	4.0%	8.0%

*IN ACTUAL PRACTICE, IF RECOMMENDED PROJECTION EXCEEDS CEILING PRICE, ONLY CEILING PRICE WOULD BE SET ASIDE.

V

SPECIAL FINDINGS

The procedures developed herein can be used as shown and should provide a consistent supportable rationale for the management and retention of EPA fund reserves. 1/ Additionally, this financial management tool can be augmented by the development of procedures that will further reduce any risk of an RS 3679 violation. These concepts have wide application and can easily be tailored to individual procurement requirements.

One of the objectives of this study was to reduce the amount of EPA funds committed. It was also desirable to use the fewest resources possible in determining the proper amount of the EPA set aside. Therefore, the following should be considered: 1) Do not monitor any contract whose EPA ceiling is less than an established floor/threshold value. 2) Establish an EPA allowance/ tolerance (a flat dollar value, a percentage of the total contract price, etc.) as a safety factor over and above the projected fund recommendation. Where the PCO has committed EPA funds in excess of the recommendation plus the safety factor, he/she should be required to justify the holding of these additional funds.

A special application of the above may be appropriate in special situations such as the preparation of estimates for potential cost growth on future procurements, and on estimates of EPA expectations to be submitted to higher headquarters or to be used in preparation for or during contract negotiations. The above methodology may also be applied as a forward pricing technique.

1/ See Appendix B, regarding BLS benchmark changes.

VI

REFERENCES

A. Armed Services Procurement Regulation, 1 Jul 79.

B. DRCCP-SC letter, 22 Jun 78, Economic Price Adjustment.

C. AR 37-20, Financial Administration, Administrative Control of Appropriated Funds.

D. AR 37-21, Financial Administration, Establishing and Recording of Commitments and Obligations.

E. AR 37-120, Financial Administration, Procurement of Equipment and Missiles, Army (PEMA) Management Accounting and Reporting System (PEMARS).

F. Employment and Earnings, US Department of Labor, Bureau of Labor Statistics.

G. Producer Prices and Price Indexes, US Department of Labor, Bureau of Labor Statistics.

Appendix A

Test Plan for Determination of Economic Price

Adjustment (EPA) Fund Requirements

1. Purpose and Scope.

This test is intended to establish the feasibility of using specific economic predictions in a systematic manner to determine contingency fund requirements for contractual Economic Price Adjustments. The test will cover 30 to 50 weapon and ammunition contracts let by HQ, ARRCOM.

2. Procedures.

a. DRSAR-PC will provide EPA information from a quantity of contracts to DRSAR-CPE. Most of the contracts should be new. Some may be a few months old, but should have a year or more to go to complete delivery. This information will be furnished to DRSAR-CPE NLT 20 Oct 78.

b. The contracts specifying Cost Index Method EPA shall be processed by the Cost Analysis Division, DRSAR-CPE, as follows:

(1) The identified labor and material indices will be analyzed for economic trend and tendency over the most recent twenty-four month period.

(2) The results of this analysis will then be entered into a regression screening program. From this program, that equation having the highest coefficient of determination and the lowest coefficient of variation will be determined. Using the results of the regression analysis and other pertinent economic information, predicted index values will be generated for the time period of the contract. From these values, fund requirements will be estimated and the contingency amount determined.

(3) Updating these fund projections will be done every three months for each contract. This will consist of adding the latest three months data (last three months index values) for each appropriate index, and subtracting the first three months data used; then these new data sets will be entered into the regression screening program as before, and the best projection equation from this new data run will be selected, again, as before.

(4) The updated fund projection equation will be used along with other economic information to make a new set of three month projections.

These projections will be compared to previous fund projections and actual changes. This analysis will be made to determine whether the initial or last projection was adequate for EPA requirements to date. Should previous projections be found to be inadequate for EPA requirements to date, the reason for inadequacy will be identified and corrective measures taken.

(5) The updating process will take place every three months from contract award date (more frequently if required) with the information being presented to the appropriate procuring contracting officer (PCO) in DRSAR-PC by the cost analyst in DRSAR-CPE. There shall be a free exchange of information between the cost analyst and the PCO's at all times.

c. For those contracts specifying Cost Index Method EPA, DRSAR-PC will perform the following actions:

(1) Initially, and as new contracts with EPA requirements come into being, it will be the responsibility of DRSAR-PC to furnish to DRSAR-CPE all contractual EPA provisions needed to compute fund requirements. These may be transmitted using the EPA Summary Sheet (see desired format at Incl 3).

(2) When EPA payments are made, DRSAR-PC shall inform the Cost Analysis Division of the amount and include a complete set of the calculations used to compute the amount paid.

d. For those contracts specifying the Actual Cost Method EPA, the following information and data is required:

(1) DRSAR-PC shall provide the contractual EPA provisions to DRSAR-CPE including the following information: (a) date of contract award, contractor name and location, (b) date of final delivery, (c) labor/material base costs (a detailed listing), (d) number of units being procured, (e) labor fringe benefits expressed as a percentage of the labor base, and (f) any additional information considered pertinent or necessary to the EPA fund computation. The desired format for transmitting this information is the EPA Summary Sheet at Incl 4.

(2) As new contracts with EPA clauses come into being, it will be the responsibility of DRSAR-PC to furnish that information as specified in para 2d(1) to DRSAR-CPE.

(3) When EPA payments are made, DRSAR-PC shall inform the Cost Analysis Division of the amount and include a complete set of calculations.

e. Contracts specifying Actual Cost Method EPA provisions shall be processed by the Cost Analysis Division as follows:

From the above (para 2d), DRSAR-CPE, in coordination with DRSAR-PC shall determine which specific labor and material indexes are applicable to each contract and then proceed as indicated in para 2b(1) through 2b(5).

f. DRSAR-PD will provide advice as needed concerning specific or general industrial economic peculiarities which may impact fund forecasts.

g. A milestone schedule for conduct of this test is shown at Incl 1 and a Summary of Test Procedures is shown at Incl 2.

h. Principal and alternate action officers for the conduct of this test are to be assigned by each of the proponent organizations as follows:

(1) DRSAR-CPE

Principal

Alternate

(2) DRSAR-PC

Principal

Alternate

(3) DRSAR-PD

Principal

Alternate

3. Test Measurement.

The methodology being tested will be considered successful if at the time that the final review of fund requirements is made:

a. Of the contracts tested, no more than those as shown on the following table shall have had their EPA requirements underestimated at the final update.

Nr. Contracts in Test	Nr. Contracts Underestimated
10-20	1
21-40	2
41-60	3
61-80	4

b. The total value of all EPA underestimates shall not exceed 25% of all EPA payments. For example, 50 contracts requiring a total of \$10M in EPA payments must have been estimated to require at least \$7.5M.

c. The total of all EPA payments shall not be less than 50% of all EPA estimates. For example, 50 contracts requiring a total of \$10M in EPA payments must have been estimated to require no more than \$20M.

d. Reprogramming to accommodate any and all underestimates could have been accomplished at ARRCOM requiring no requests for additional funds from higher headquarters.

4. Reporting of Results.

The progress of this test will be monitored and results reported by DRSAR-CP in coordination with DRSAR-PC and DRSAR-PD to interested HQ ARRCOM authorities on a quarterly basis. At the conclusion of the test a final report will be prepared and briefed to ARRCOM decision authorities. See attached Milestone schedule.

Milestone Schedule

Date	Action
Oct 78	Information briefing to CG.
Oct 78	Initiate test. DRSAR-PC provides contract information to DRSAR-CP.
Nov 78	Fund requirements determined by DRSAR-CP for initial contracts. Results furnished to DRSAR-PC.
Jan 79	Initial updates made. Status report given to PP, PC and CP.
Apr 79	Continuing updates. Status report to PP, PC, PD, DP, CP and CG.
Jul 79	Continuing updates. Status report to PP, PC and CP.
Oct 79	Final updates. Final report to PP, PC, PD, DP, CP and CG.

(Incl 1)

Test Procedure Summary

DRSAR-PC	DRSAR-PD	DRSAR-CP
1. Provide contract EPA information to CP.		
	2. Advise CP on industrial economic peculiarities which may impact forecast.	
		3. Use EPA information plus available economic data to forecast fund requirements. Provide fund forecast to PC.
4. Monitor EPA payments and report same to CP. Report to CP any contract changes affecting EPA provisions.		
		5. Use payment data, contract changes and new economic data to modify fund forecasts as needed. Provide revised fund forecasts to PC.
6. In coordination with CP and when contract is completed, analyze validity of fund forecasts in light of actual EPA payments.		6. (Same as under PC)

(Incl 2)

EPA SUMMARY SHEET

PCO NAME ______________________ EXT __________

* CATEGORY ______________________

CONTRACTOR NAME & LOCATION ______________________

ITEM ______________________

CONTRACT NO. ______________________

CLASS OF EPA CLAUSE ______________________
(Labor/Mat'l, Index Code)

PERCENTAGE OF CONTRACT PRICE COVERED BY EPA LABOR ______% MAT'L ______%

ALLOCATION OF LABOR/MAT'L BY THREE MONTH PERIOD (Expenditure Profile)

EPA CEILING ______________________

PERIOD	1	2	3	4	5	6	7	8
LABOR								
MAT'L								

CONTRACT PRICE BY PROGRAM YEAR ______________________

1 Award Date	2 CLIN	3 Quantity	4 Unit Price	5 Total Price	6 EPA Set-Aside	7 EPA Paid	8 Date of EPA Payment

A. Fuzes
B. Sml Arms Ammo (Up to 20mm)
C. Lrg Cal Ammo, Metal Parts
D. Lrg Cal Ammo, Cart Case
E. Small Arms Weapons
F. Artillery Weapons
G. Aircraft Armament
H. Combat Vehicles
I. Secondary Items

(Incl 3)

DRSAR Form 4400, 20 Oct 78 (OT)

ACTUAL COST METHOD

EPA SUMMARY SHEET

PCO NAME ______________________________ EXT ______________

* CATEGORY ____

CONTRACTOR NAME & LOCATION _______________________________

ITEM ____

CONTRACT NO. ____

CLASS OF EPA CLAUSE ______________________________________
(Labor, Mat'l, Labor and Mat'l)

CONTRACT AWARD DATE ______________ DATE OF FINAL DELIVERY __________

LABOR/MAT'L BASE CO^TS (attach detailed listing) ____________________

LABOR FRINGE BENEF ... ED AS A PERCENTAGE OF THE LABOR BASE ______ %

EPA CEILING __________ ____________________________________

ANY ADDITIONAL INFORMATION _______________________________

____

1 Award Date	2 CLIN	3 Quantity	4 Unit Price	5 Total Price	6 EPA Set-Aside	7 EPA Paid	8 Date of EPA Payment

*A. Fuzes
B. Sml Arms Ammo (Up to 20mm)
C. Lrg Cal Ammo, Metal Parts
D. Lrg Cal Ammo, Cart Case
E. Small Arms Weapons
F. Artillery Weapons
G. Aircraft Armament
H. Combat Vehicles
I. Secondary Items

Incl 4)
DRSAR Form 4401, 20 Oct 78 (OT)

Appendix B

Adjusting to Revised Bureau of Labor Statistics Benchmarks

A method of relating the Bureau of Labor Statistics (BLS) Standard Industrial Classification (SIC) codes revised benchmark values (Jul 78) with the preceding BLS values, prior to Jul 78.

1. Select a particular SIC code.

2. Run a regression analysis using the time period Jan 74 thru Jun 78.

3. Select the best fit regression equation to project the Jul 78 value. (The best fit equation is a combination of the highest coefficient of determination and the lowest coefficient of variation).

4. Ascertain the difference between the Jul 78 projected value (as per regression analysis) and the book value for Jul 78. (Book value is the value published by the BLS)

5. The difference will be a constant or correction factor that will be added or subtracted to all future book values for this code, beginning with Jul 78.

6. The book value will be noted as negative and always added to the projected value.

7. Examples:

	7.35	proj value		5.90	proj value
-	7.30	book value	-	6.55	book value
+	.05	constant	-	.65	constant

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Low price
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cost estimates

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Economic Price Adjustment (EPA)	Escalation	Labor Index
EPA	Inflation	Labor Change
Contingent Liability	Government Contracting	Material Index
Contingency	Contracting	Price
Contingency Funding	Price Fluctuations	Material
		Labor Rate

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

In the current economic environment, it is prudent strategy for the Government to avoid the use of Economic Price Adjustment (EPA) clauses in procurement contracts. However, many vendors are insisting upon the inclusion of contractual EPA stipulations as a hedge against inflation. Consistent with the use of EPA clauses, Procuring Contracting Officers (PCO's) typically were committing EPA funds up to the contractual ceiling to assure that an over obligation of funds (an RS3679 violation) would never occur; a practice found to reserve funds (continued)

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ABSTRACT continued:
in excess of requirements. Examined herein are current methods of determining the level of EPA funds to be reserved and the development of some improved methods for estimating these requirements. This management tool provides structured formulae which can improve justification of retained/committed EPA funds and allow the release of committed funds for use elsewhere.